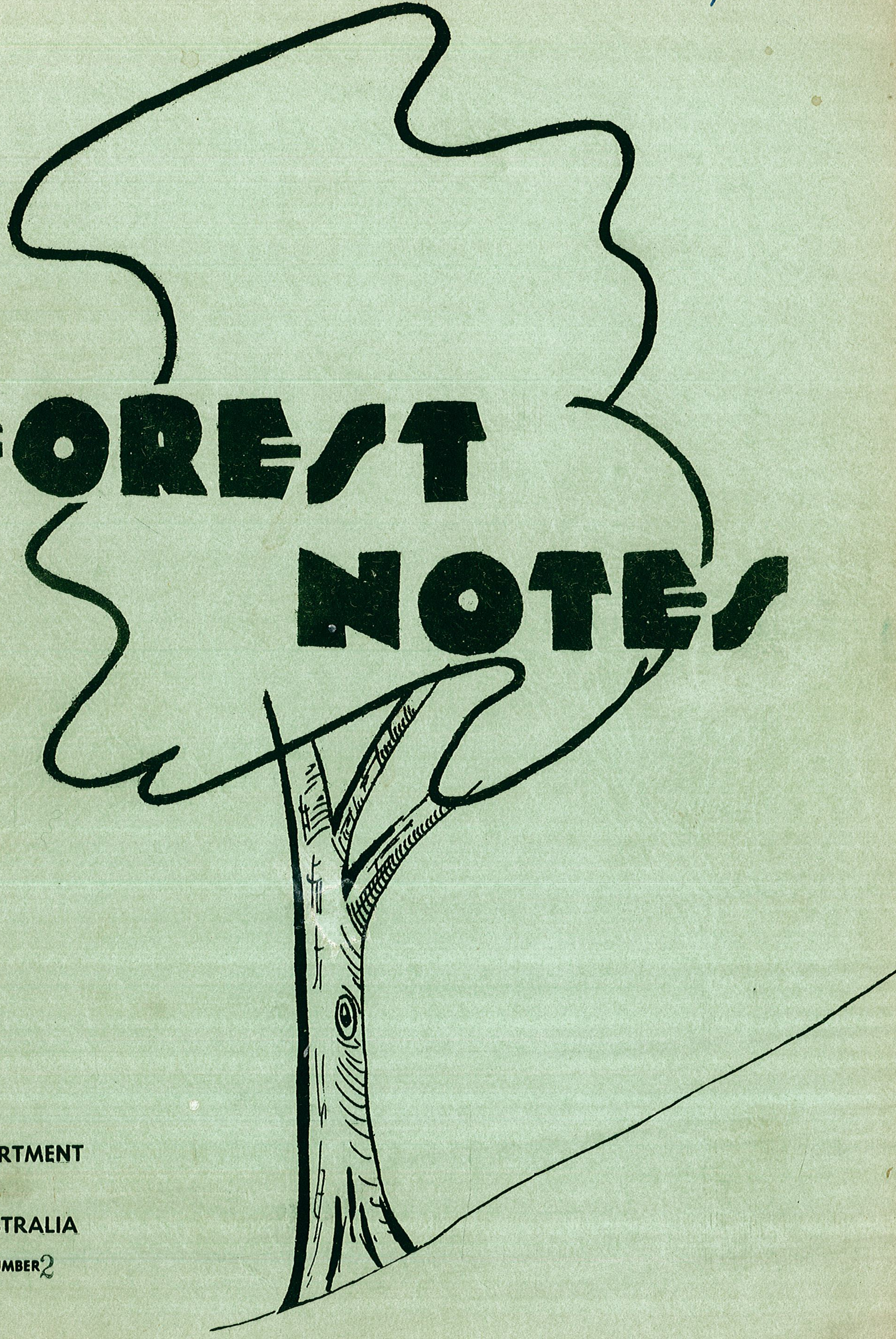
5(2) Pemberton Office (2)

FOREST NOTES



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FOREST NOTES

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Editor : R.J. Underwood

CONTENTS

AIRCRAFT CONTROL BURNING GROUND MARKING PROCEDURE.

by G.W. vanDidden.

Introduction:

The controlled burning of large areas of forest, to reduce the fuel accumulation and thereby reduce the fire hazard, is one of the methods used to protect West Australian hardwood forest from damage through wildfires.

Aircraft burning to achieve this aim is only relatively new in this state, yet the growth has been rapid. Since the inception in 1965, when 53,000 acres were burned, annual acreage has now risen to 188,363 acres. The proposal for 1967 is aimed at approximately 411,000 acres.

This rapid growth is mainly due to the large areas which can be burned successfully under suitable weather conditions with controlled rates of spread and minimumfire damage. In the lower south-west there are large areas of forest with thick scrub, mixtures of forest types and sparse roading. Annual grid ignition where possible can be costly, difficult and sometimes dangerous, therefore aerial ignition has been found a safe alternative.

Equipment:

The aircraft used in the operations during 1965 and 1966 was a Cessna 337 Twin Engine push-pull Skymaster. The aircraft proved satisfactory during the 1965 season so was again chosen for the 1966 season. This season lasted longer and brought out one of the drawbacks of the Cessna 337. Under full load and high temperatures the Cessna would barely climb on the front motor, or at only 200 f.p.m. The decision was therefore made to change over to a Beechcraft Baron B55 for the 1967 season. This aircraft is a twin engine cantilever monoplane with retractable landing gear. It has two six-cylinder engines rated at 260 h.p. where as the Cessna has a rated horsepower of 210 per engine. The B55 being more powerful will provide a higher safety margin in climb performance on one motor.

Dropping Machine:

The initial burns in 1965 were started with a priming device for injecting ethylene glycol into capsules, by the operator pulling a lever, causing a hypodermic needle to puncture the top of the vial and delivering a liquid charge of 1.5 ml into the capsule. After a few moments the operator could feel a pulse from the plate on which the incendiary was placed. This was the signal to drop the capsule out through an ejection pipe. The machine was fatiguing to operate so changes were made for the 1966 model.

The 1966 model consisted of an eight station rotating turntable, geared and timed to an automatic injection syringe. It was electrically driven from

The aircraft's internal electrical system. The regulation of turntable speed and capsule ejection rate was controlled through a large twin coil rheostat, mounted on top of the machine. This gave a range of speeds from one ejection every two seconds (or five chains) to one every six seconds (or 15 chains if travelling at 100 knots). The machine was 24" wide x 18" deep and 36" high with an all-up weight of 145 lbs. The position for mounting was on the right hand side of the plane, taking the position of the centre seats.

The left hand side in the centre was taken up by a metal cabinet containing trays for 1,850 incendiaries, this being sufficient for 9,250 acres at a spacing of 10 chains by five chains.

Pre-burning Preparation:

Inspection: The areas planned for control burning are inspected as for normal burn. Quantity of fuel must be even, to allow the incendiary capsules a chance to ignite surrounding fuel.

Perimeter tracks: Should permit the rapid movement of transport for marker vehicles and suppression forces.

Edge Preparation: Any swamps or flats with ti-tree and paper-bark, crossing an external track receive particular attention when putting an edge burn of 2 to 5 chains deep around the whole area. This is done with a flamethrower, mounted on a four-wheel-drive vehicle or a tractor. The edge burn may not be necessary if the adjoining area is recently burned.

Index table: All areas inspected for the proposed burns have a prescription written to suit the particular area. The prescription is related to the crown height of potential crop trees. The areas are then summarised into an index table, an example of which is shown, for Spring 1966.

[See over page for Index Table]

Index Table

Table shows area, prescribed fire danger, fuel age and job number,

Job Number	Green					Blue					
	Age Years 4	5	6	7	Acres	Age Years 4	5	6	7	Acres	Division
		1			5312	3				2880	
		2			8704			6		5120	Shannon
		4			15040		7			10368	
			5		7040						
			8		7000						
					6208		9			7488	Pemberton
		11			7040						
	13				6912	12				10624	Manjimup
	14				17344						

N.B. Where 4 year-old = 2.5 to 3.0 tons/acre fuel.
5 year-old = 3.0 to 3.5 tons/acre "
6 year-old = 3.5 to 4.0 tons/acre "
7 year-old = 4.0 to 4.5 tons/acre "

The index table is the basis for selecting daily programmes which are obtained by consultation between the O.I.C. concerned, the F.C.F. and the Fire Control staff.

The forecasted fire danger is matched with the prescribed fire danger and the result is then matched with the index table to select the days programmes.

Day to day Operations:

1. Day before the burn. Tentative planning of the area for burning by matching the forecasted fire danger to the index table.

2. Day of burn - 0745 forecast to confirm previous day's planning or alter if fire danger is different.

3. 0745-0800. Planning to involve the level of suppression forces, calculation of strip widths and direction of flight lines.

4. Flight plans were drawn up in the office after establishing the required factors, such as strip width and direction of flight lines.

The majority of plans were drawn up individually, this job being most time consuming. Nannup Division produced the ideal plan. These were sun-prints made from a single master sheet, showing in weather details, flight lines and numbers, control point position, patrol sectors for suppression crews and marker crews. These will be generally used during 1967.

5. O.I.C. suppression and O.I.C. markers depart 0800 for areas to be burned.

On arrival of the aircraft at the area to be burned it was found that the following were a great advantage in helping to identify the starting flight line. The marker crews had a hot log fire going and some five minutes prior to E.T.A. over the burn, threw green branches or material on the fire to produce a dense smoke. Alternatively, the co-pilot could call for a flare from whichever marker was nearest to the aircraft.

More powerful beacon transmitters will be used during 1967, and these will assist also in finding the area to be burned.

On receiving take off instructions from ground control, the aircraft would take off and set a heading for the burn.

Ground Marking: On arrival in the burning area the aircraft would do a complete circuit of the area to familiarise the crew with the shape and layout.

It was always the practice to receive the go-ahead from ground control before commencing the first flight line.

On receiving this signal it was found an advantage to make the first flight line a dummy run to enable the Pilot and the co-pilot to assess the wind drift, to determine the amount of Flame trajectory they could expect to see, and to note the strength of the marker beacons. All these factors were variable in the various areas but remained reasonably constant in any one area. This practice was found particularly useful in the southern Karri areas with their greater tree height and more undulating terrain. It was found that the following standard practice could be adopted for bombing runs of from $2\frac{1}{2}$ to 6 miles.

With the aircraft approaching from north on a north to south run the co-pilot calls "North beacon on " then "south flare" the marker on the south side fires his flare, and calls "flare fired". Co-pilot replies "flare sighted" "south on" "north off" (see diagram). The north marker shifts to the next position. The distance will be measured by a speedo graduated in chains, which was developed by the staff from the Manjimup workshop from a second hand Austin 70 speedo (design by Mr. L. Marshall). The speedo runs from either a Jeep or Landrover brakedrum by means of a polythene wheel transmitting the movement through normal speedo cable to the speedo.

Once the north marker is in position he advises the aircraft "north on line 2 " or as the case may be. As soon as the aircraft has passed over the south marker he shifts to the next flight line. The south marker should reach his position as soon as possible as the plane needs only 60 to 70 seconds to complete the turn and be over the starting point on the next flight line. As soon as the southmarker is in position he should call the plane by notifying "south ready". Three to five seconds after the plane has passed overhead the beacon should be switched off. The co-pilot will then call for "north-on" or "north flare". If only a flare is called for the beacon is still switched on.

The beacons are essentially small wireless transmitters with a frequency of about 1.7 m.c. and on R.F. power of 25 watts. The plane is fitted with A.D.F. equipment to accept the required frequency, broadcast by the radio beacon. The A.D.F. is fitted with a rotating aerial which locks on to the signal from the beacon on the marker vehicle.

The rotating aerial is coupled to a dial graduated into 360°, the needle pointing to the direction from which the strongest signal is received.

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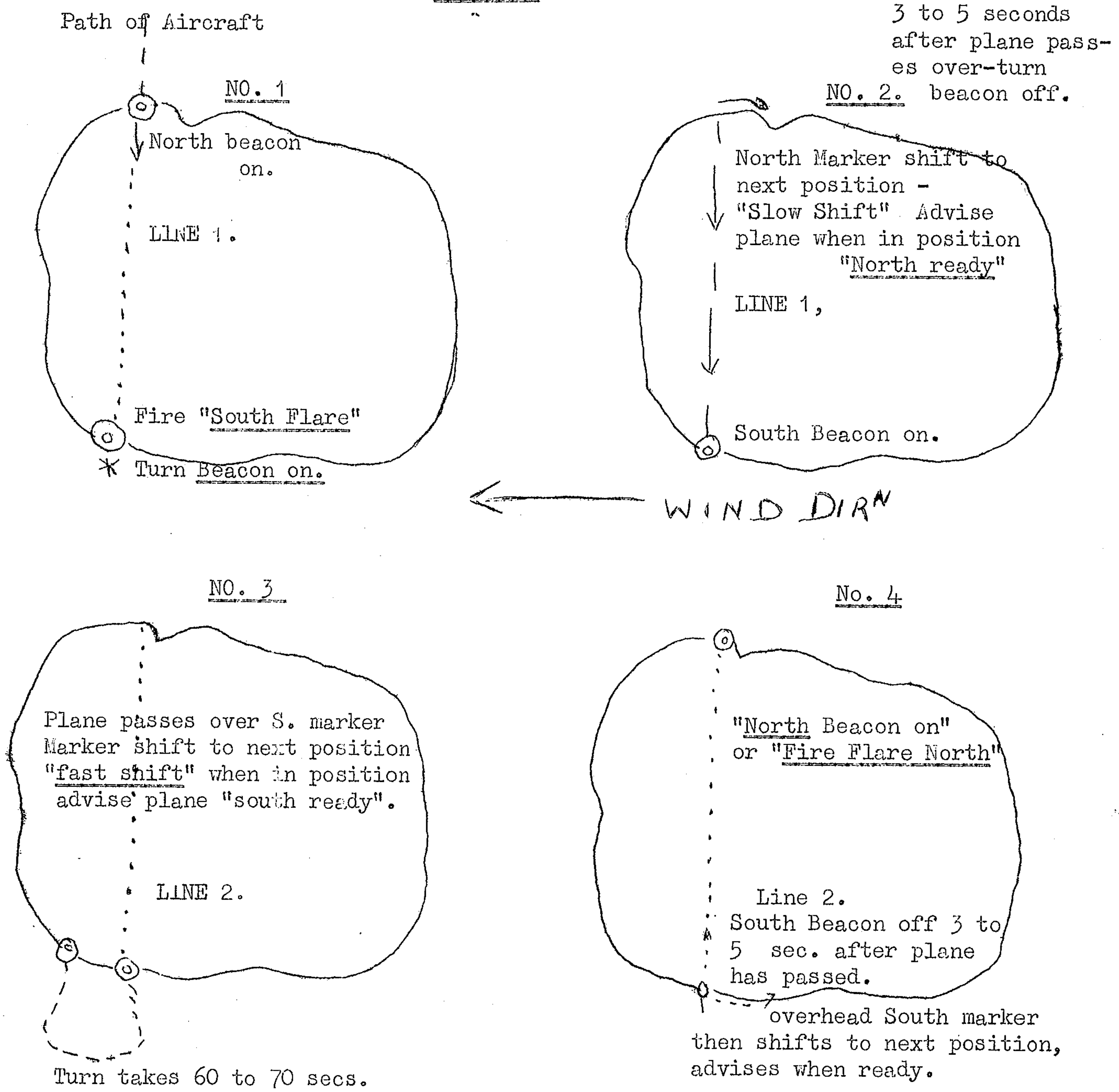
DIAGRAMS



The efficiency of the burn depends to a great deal on the speed of the marker crews and their proficiency. N.B. Speed for the distance measuring meter should not exceed 10 m.p.h.

JUST FOR APPEARANCE SAKE.

by J. McCormick.

Western Australia is often referred to as 'The Wildflower State' yet to live up to its reputation a considerable amount of time and effort must be spent on the conservation of native flora. The Department's role in this is probably greater than is generally accepted, for by the continuation of its controlled burning policy, and given the process of time, the major scrub species which are of little aesthetic value and are at the same time detrimental to the forest will be removed, thus making room for the smaller and more interesting plants whose appearance en masse is worthy of comment.

Another of the Department's activities which can add to the general amenity is Window Dressing. This generally takes the form of roadside thinning and roadside planting. The former is always successful, the latter only sometimes, for roadside planting can either enhance or spoil the natural environment according to the manner in which it is carried out.

Roadside planting takes on many forms, the first and most obvious being:-

Form A. The pure pine block: planted up to the road edge save for a ploughed fire break. In appearance it is out of context with the natural environment; it lacks interest and eliminates all native flora.

Form B. Can be referred to as the random roadside planting for so it appears, the trees being planted in rows parallel to the main highway in such a manner that what meets the eye is - four Cypress trees, six mallee type trees, five tall eucalypts etc. This form is interesting and does not eliminate native flora but it is artificial and does not blend well with the environment.

Form C. The pure eucalypt planting; is the most natural of all roadside plantings and by making use of the multifarious eucalypt species available in Australia some interesting effects can be obtained particularly when consideration is given to foliage and bark colouring. The planting of small groups along roadsides is never successful.

Window dressing is universally accepted and in some densely populated countries is indeed demanded by members of the public, for in those countries many a pleasant vista has been marred by unimaginative forest practices. In the not-too-distant future Western Australia will have a large and mobile population ; more and more people will travel through the forest areas and much of their awareness of the Department's activities will be governed by what they see.

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FIRE versus FAUNA.

by M. Law.

With the advent of aerial burning and the almost spontaneous ignition of large tracts of forest, the time seems opportune to discuss the effects this method of burning may have on the continued existence of our forest fauna.

Following the fires which swept throughout much of the Dwellingup Division in 1961, one rarely observed until quite recently, any species of fauna in the burnt areas. Areas unburnt at that time were inhabited by normal fauna and bird life. There may have been a mass exodus from the fire areas, but this is doubtful and is not verified by excess numbers of fauna in adjacent unburnt areas. My impressions are that the animals, rather than evacuating en masse in the face of the fire, run confused until succumbing to the smoke and flames.

With the exception of the larger marsupials, many of our fauna breed in select areas often associated with rivers and swamps. These conclusions were reached by observation and field confirmation by naturalist Mr. Harry Butler, of the W.A. Museum, who visited Dwellingup.

A brighter picture associated with aerial burning appears to be that many of the breeding sites in the jarrah forest are located on the river systems and adjacent swamplands; I am led to believe that these areas do not lend themselves easily to aerial burning. The areas of swampland do not burn readily in spring and could be ground burnt in Autumn. This would temporarily destroy breeding sites, but would, I feel, be preferable to a total aerial burn in late Autumn.

Bearing these points in mind, we should perhaps endeavour to observe breeding grounds and note their locations with a view to their preservation. It is realised that this will present difficulties as regards aerial burning, many possibly unavoidable. Whatever the problems, we should strive to preserve our diminishing fauna and create conditions suitable for the prolific growth of all desirable species.

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LETS GET OUR CORNER PEGS STRAIGHT

by L.G. Brigden.

When I commenced work in Pine Research in W,A. some eighteen months ago, I was surprised to find that plots of fixed dimensions were used in plantations i.e. plots 2ch. x 2ch. or 1ch x 1ch giving areas of 0.200 acres and 0.100 acres respectively, and that the position of the corner pegs in relation to the rows was not considered.

This was contrary to my experience in 'another place' but as I understood this to be a local practice only, I did nothing other than agitate for a change in local practice. However, from recent information, I now understand that the practice is also used elsewhere.

I submit that there is only one way in which plot corner pegs can be located to give a true area in a plantation and that plots established in any other way give incorrect results, the degree of error varying with the spacings adopted in planting.

To elaborate on the term 'true area in plantation' let us consider the position of each individual tree. Apart from other reasons of convenience a plantation is laid out at certain spacings to allot to each tree a certain growing space. In the case of a plantation spaced at 9' x 7' each tree has 63 sq. ft. in which to grow, therefore each tree is considered to be growing in the middle of a rectangle of 9' x 7'. Consequently N trees would occupy an area of N x 9 x 7 sq. ft. or 63N sq. ft.

Consider the diagram (page 11) which represents a section of a plantation planted at 9' x 7' which gives a stocking per acre of 691. This of course is a theoretical plantation as the exact spacing is rarely achieved in routine planting, but the proposal is valid for any plantation regardless of how erratic the spacing is.

Points MNPQ represent the corner pegs of a plot 1/10 acre in area bounded by sides 1ch. x 1ch. By counting the trees contained by these points it will be seen that the stocking is 630 p/ac.

Points HJKL represent the corner pegs of a plot 1/10 acre in area (again 1ch. x 1ch.) but with the corner pegs relocated to include other stems to give a stocking of 800 p/ac.

Hence it can be seen that by simply relocating the corner pegs without altering the dimensions of the plot the stocking per acre can change from 61 below the true stocking to 109 above.

Correctly positioned the pegs would be situated at points W, X, Y and Z and would contain an area of 0.091 acres containing 63 trees and representing a stocking of 690 p/ac.

To obtain the correct figure as illustrated above, the following procedure should be adopted for establishment of plots in plantations:-

1. Locate the pegs as nearly as practicable midway between the rows and adjust their position along the rows so that the line joining the pegs across the rows is not intercepted by a tree or nearly so.

2. Measure the lengths of the sides and diagonals and obtain the total area by adding the areas of adjoining triangles. The area of a triangle whose sides only are known is found from the formula

$$\sqrt{s(s-a)\ (s-b)\ (s-c)}$$

where $s = \frac{1}{2}(a + b + c)$
and a, b, c are the sides

Where none of the angles between adjacent sides deviate by more than 5° from the right angle, the area may be obtained from the product of the means of opposite sides.

The areas of plots should be shown correct to 3 decimal places.

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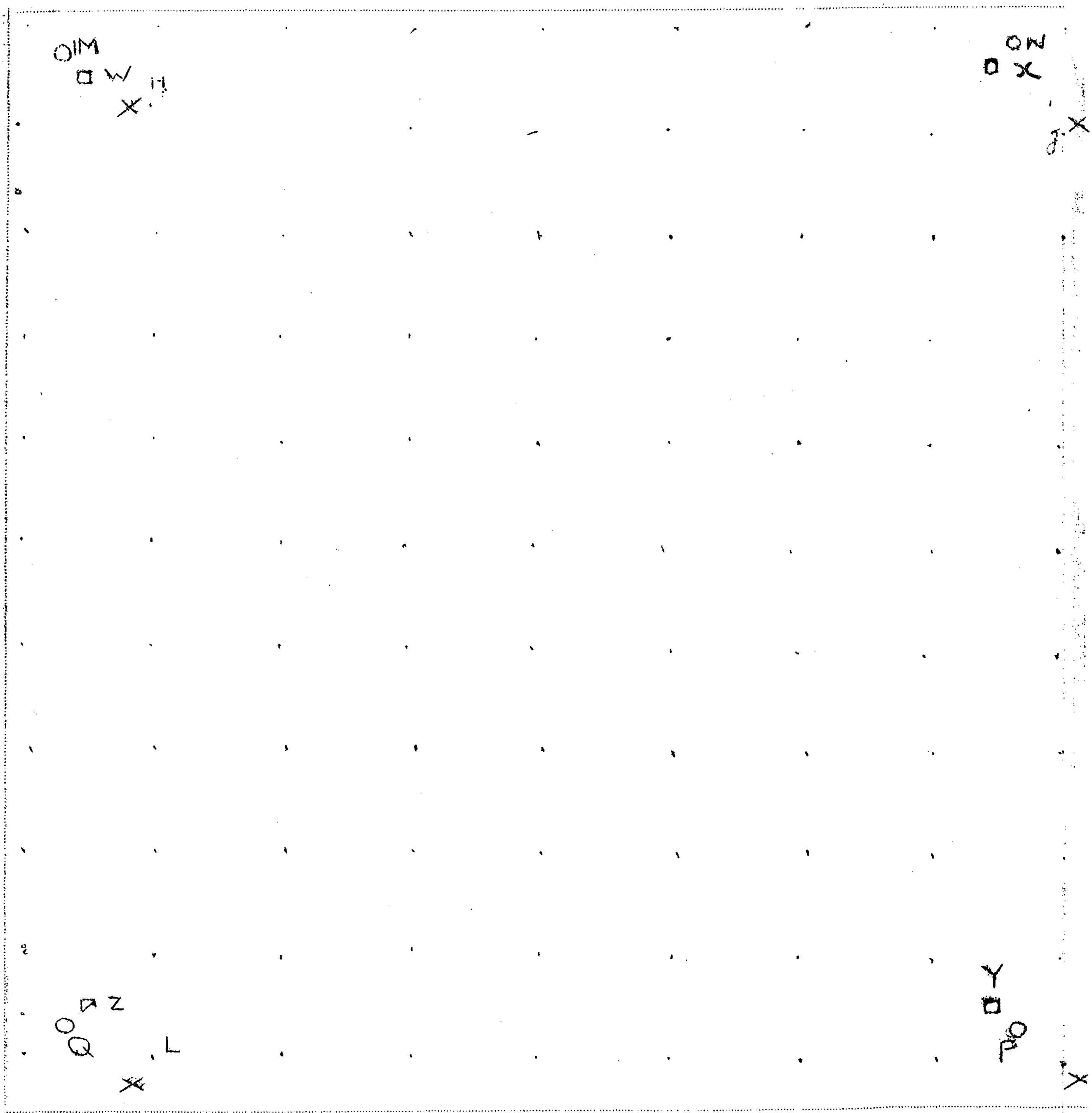

SECTION of PLANTATION

SPACING EXACTLY 9'x7'

SCALE 1 INCH = 10 FEET

RE HABILITATION OF BAUXITE MINING AREAS.

by J.A.W. Robley.

Western Aluminium N.L. (No liability) started mining bauxite in State Forest North of Jarrahdale in 1963 and to date have cleared an area in excess of 500 acres.

This figure does not include other areas cleared for two crushing plants (one under construction) and the attendant road and rail facilities.

Briefly, the company mines by an open cut method after clearing all vegetation from the area. Prior to clearing by the company, the Forests Department organises the removal of all merchantable timber, poles, piles etc. and also collects compensation at the rate of $2.00 per acre cleared.

The company is responsible for replacing over burden over the mined areas.

Prior to mining, the areas carried good quality Jarrah Forest ranging from P 30/60 JA to M 60 JA growing on sandy gravels overlying bauxite deposits. The P content of these soils is generally low ranging from <2 to 101 p p m in the sites tested.

After mining the area resembles a moon landscape with a multitude of adjoining craters with near vertical walls rising 10' - 12'.

This is caused by the companies selective mining practice where by they cease to dig once the bauxite content has reached a certain commercial minimum.

The over burden is heaped on these remaining islands and is pushed down into the craters once mining operations have finished.

The over burden is then spread by bulldozer to form an even layer about 9" deep over the crater floor.

The actual crater floor is composed of "soft low grade bauxite"; the term "soft", however, is purely relative as even under ideal conditions it is impossible to dig it with a spade.

Surprisingly it is very porous and only in very low lying places does water collect; this is caused by fine material accumulating at the bottom of slopes and blocking the natural porosity of the surface.

Interest is being shown by the company in the re-habilitation of the mined areas being carried out by the Forests Department, and they were able to cite instances where a similar problem had been tackled in Arkansas and success had been obtained with planting of Sweet Gum, (Liquidambar styraciflua)

In August 1966 the first planting of these crater areas was tried by the Forests Department over an area of about fourteen acres.

Pines and eucalypts were planted in craters where the over burden had been replaced and two control areas were set aside (each 1/10 acre) where plants were put into the crater floor with no overburden (the planting tool used being a cobra Jack hammer) and an area where the floor had been ripped to a depth of 9" with a D 7 Bulldozer still with no over burden replacement.

The following species were tried.

Pines	P. pinaster		
Eucalypts	E. cladocalyx E. maculata E. microcorys E. saligna.	E. globulus E. bicostata	only planted in Control area.

The pines were planted 6' x 6' and the eucalypts 12' x 12'.

At the time of planting all eucalypts received 2 ozs. Blood and Bone 2 ozs. Potato Manure E mixed with the soil at the bottom of the planting hole.

The pines received 4 ozs. Superphosphate as a surface dressing in late September, 1966.

Following planting, several nights of severe frost were experienced at Jarrahdale and by virtue of the fact that planting was in the hollows many Eucalypts were burned by the frost.

Most plants recovered however and survival figures taken in March 1967 were as follows:-

E. cladocalyx	94%
E. microcorys	80%
E. maculata	65%
E. salinga	84%
P. pinaster	95%

Ten months after planting the height of the Eucalypts is between 2' 6" and 3' 0" and all plants appear to be vigorous and healthy.

The pines have not shown similar height growth but are on a par with other pinaster planted in Kelmscott Division and their condition is satisfactory.

In the control areas survival and growth has been generally poorer as could be expected.

The survival count taken in March, 1967 was as follows:-

Species	Ripped Only	Unripped
P. pinaster	50%	0
E. saligna	25%	70%
E. microcorys	100%	100%
E. maculata	35%	75%
E. globulus	45%	50%
E. cladocalyx	15%	60%
E. bicostata	not tried	90%

The Eucalypts have grown little since planting and are still dying so the survival is poorer now than at the March count.

The condition of the surviving pines is satisfactory.

It is interesting to note that survival of the plants in the unripped area is better than in the ripped area with the exception of P. pinaster.

A possible explanation could be that the capillarity properties of the porous bauxite was broken down by the ripping, thus denying plants soil moisture during the summer.

Planting of the mining areas will be continued in 1967 with a range of species being tried.

Although it is early yet to draw any conclusions, results so far are clearly encouraging.

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MUNDARING'S MONSTERS

by C.A. Miller.

Past issues of "Forest Notes" have carried articles giving the dimensions of some large *Pinus radiata* and *Pinus pinaster* in the plantations at Mundaring Weir.

The articles were supported by notes of praise from the measurers (local officers) so readers naturally tended to regard with some scepticism, the figures presented.

However field work on the Plantation Inventory this winter provided the opportunity for independent observers to measure some of the large trees.

The most outstanding of these was a *P. pinaster* in compartment 5, Darkin (possibly the tree described by P.N. Hewett in "Forest Notes" of September, 1960). Its dimensions on 31-7-67 were as follows:

D.B.H.O.B.		22.15 inches
Bark Thicknesses	North side	1.80 "
	East "	2.10 "
	South "	1.60 "
	West "	1.90 "
D.B.H.U.B.		18.45 "
Total Height		118-120 feet
Volume (U.B. to $2\frac{1}{2}$" crown)		93.9 cubic feet

The height of this tree is its most remarkable feature. Mr. D.H. Perry has indicated that the tallest *P. pinaster* he heard of in Portugal was 109 feet, so it is possible that the Department has one of the tallest *P. pinaster* in the world in its Darkin Plantation.

Height was measured with a "Suunto" clinometer and since the tree has a moderate lean from N.E. to S.W., readings were taken from both S.E. and N.W. to give the figures recorded here. There is no doubt that climbing the tree would enable a more precise measurement to be taken, but time and the Inventory have not permitted this to be done.

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NITROGEN AND THE AVAILABILITY OF SOIL AND FERTLISER PHOSPHORUS TO PLANTS

by

R.J. Underwood

I. Introduction.

It is an interesting paradox that while phosphorus is one of the most important of the plant nutrient elements, phosphorus-deficiency is without doubt the most widespread and important mineral inadequacy affecting the crops of the world. Agricultural and forest crops over enormous areas in many countries (particularly Australia, South Africa and Great Britain) are limited by deficiencies in phosphorus supply.

This circumstance has had two results (i) the wide-scale and routine use of phosphorus-supplying fertilisers in affected areas, and (ii) the stimulation of soil chemists, agronomists and silviculturalists to enquire into the behaviour of phosphorus in the soil and factors which affect its availability to and uptake by the plant.

These enquiries have shown that the chemistry of soil phosphorus is extremely complex : the ability of the plant to take up phosphorus from the soil is governed by many interacting climatic, soil and plant factors.

Reported in the last issue of Forest Notes (Vol. 5, No. 1) by A.L. Clifton, was an example of one of these phosphorus interactions. Clifton reported C.S.I.R.O. findings that the use of a combination phosphorus and nitrogen fertiliser resulted in a significantly greater growth response of pines on low-fertility sites than if only phosphorus or nitrogen fertilisers alone were used. As there can be little doubt that West Australian foresters will be hearing more of this phenomenon in the future, perhaps it is an appropriate time to briefly discuss the behaviour of soil and fertiliser phosphorus in the soil and the effects of nitrogen additions on this behaviour.

II. The Behaviour of Phosphorus in the Soil.

According to Russell (1956) phosphorus has been found to exist in the soil in four different groups of compounds. In all of these phosphorus occurs as the phosphate, PO_4. The groups are:

(a) Inorganic minerals containing phosphorus as an integral part of their structure - e.g. , apatite.

(b) Insoluble phosphate "reaction-products", formed when soluble phosphate fertilisers are added to the soil.

Some uncertainty as to the exact nature of these compounds still exists,

(c) Phosphates held on the surface of hydrated iron and aluminium oxides.

(d) Organic phosphates that exist in humus, soil organic matter and the living soil population.

According to Black (1957) only phosphates in a soluble form (the H_2PO_4 - ion) can be absorbed by the plants - phosphorus cannot be taken directly from the solid phase nor absorbed as an organic compound.

It would seem logical to assume, therefore, that deficiencies in soil phosphorus could be simply overcome by just adding a sufficient quantity of water-soluble phosphate to the soil. Unfortunately it is not as simple as this. Phosphate fertilisers differ from nitrogen, calcium and potassium fertilisers in that only a relatively small proportion of applied phosphate is taken up by the crop. This proportion varies according to the species, other factors which may limit plant growth (such as zinc deficiency), the pH of the soil and certain climatic factors. As a general rule, recovery of added phosphate is rarely in excess of 20% (Black, 1957). The other 80% forms insoluble phosphate reaction products and becomes locked, or "fixed" in the soil.

III. The Phosphorus-Nitrogen Interaction.

Since the early part of this century it has been well known that the addition of nitrogen generally increases uptake by plants of both soil and fertiliser phosphorus. Since then, a great deal of work has been done on this so-called "phosphorus-nitrogen interaction".

Broadly speaking, the effect of nitrogen on the uptake of phosphorus can be divided into two groups : (i) chemical effects and (ii) biological effects.

1. Chemical Effects. According to Grunes (1959), the addition of nitrogen can have two chemical effects on phosphorus availability to the plant: salt effects and pH effects.

Salt Effects. Work by several investigators, including Wild (1950) and Caldwell (1960) has indicated that different nitrogen carriers have different effects on the solubility of soil and fertiliser phosphorus. Their work has shown that :

(i) The uptake of phosphorus from phosphates of low water-solubility was not affected by the addition of nitrogen in either the ammonium or nitrate form.

(ii) Salts such as ammonium nitrate and ammonium sulphate markedly increased uptake of phosphorus from superphosphate.

(iii) Salts such as calcium nitrate and sodium nitrate have no effect on phosphorus uptake under any conditions.

The implication of these findings is that the effects of nitrogen salts on phosphorus availability appears to be principally an effect of the ammonium ion.

pH Effects Phosphorus availability is profoundly influenced by the pH of the soil. As a general rule, phosphorus availability is greatest in neutral and least in acid or alkaline soils (Russell, 1956). Consequently we would expect phosphate availability to increase in soils which are strongly acid or strongly alkaline when some other factor tends to adjust soil pH towards neutrality.

It has been shown that additions of nitrogen can increase phosphate availability in this way (Lorenz and Johnson, 1953; Rennie and Mitchell, 1954) Several workers have shown that increased phosphorus uptake will occur following (i) the addition of a residually-acid nitrogen fertiliser to an alkaline soil, or (ii) the addition of a residually-alkaline nitrogenous fertiliser to an acid soil.

pH effects such as these could only be expected in soils not highly buffered against pH change.

2. Biological Effects . Nitrogen is a fundamentally important plant nutrient in its own right, so it is reasonable to expect that some of the effect of nitrogen in causing an increased uptake of phosphorus is due indirectly to the effects of nitrogen itself on the growth rate and general thrift of the plant.

In a soil in which all other plant requirements are adequate the addition of nitrogen will stimulate both root and top growth of the plant. Nitrogen, in fact, is essential for the growth of roots and is an important fertiliser for root-crops grown on low-N soils. In view of this it may be submitted that additions of nitrogenous fertilisers to N-deficient soils increases the uptake of phosphorus through a stimulation of root growth and thus an increase in both the foraging capacity of the plant root system and the volume of soil explored.

IV. Literature Cited.

[References cited in the above article are available from the writer. They are excluded here to save space - Ed.]

WILDFLOWER SONG

by J. McCormick

Come to Western Australia, the tourist posters say
For it is simply wildflowers, wildflowers all the way,
Even in the metropolis you can find amplexicaulis
And perfoliate Hibbertias any day.
There are black boys and black gins
And 'twould be a mortal sin
If the road boards came and cleared them all away.
And if you dig the jargon
For which I beg your pardon --- there's
Proteaceae Rutaceae and Amaryllidaceae
Myrtaceae Linaceae and dear Papilionaceae
Lemnaceae Lauraceae and small Stackhousiaceae
And though there are no roses
We have lots of prickly moses
and weeds.
Even intellectuals swoon
When our wildflowers are in bloom
With their petals all papilionate and gay.

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SALESMANSHIP

"A corporation may spread itself over the entire world and may employ a hundred thousand men, but the average person will usually form his judgment of it through his contact with one individual. If this person is rude or inefficient, it will take a lot of kindness and efficiency to overcome that bad impression.

" Every member of an organization who, in any capacity, comes in contact with the public is a salesman and the impression he makes is an advertisement, good or bad."

My favorite quotation : Walter M. Casey.

[Contributed by Mr. R. Wallace]

BELIEVE IT OR NOT!

by

Charles Peaty

The old master violin makers used to scramble around the Alps tapping the trunks of spruce trees with axes in search of those with resonance.

* * * * *

It is said that one cannot tell the sex of a young Gingko biloba, the variety of a hybrid poplar or the age of a big jarrah except over cocktails at a foresters conference.

* * * * *

The great door of St. Peter's in Rome is made of Cupressus sempervirens felled and seasoned at the time of Constantine.

* * * * *

It is said that ....

Eve "applied the leaves of Ficus carica when the facts of life were made clear to her by Adam;

the Ark was constructed of Cedrus libani (perhaps to reduce the overpowering effluvium!) ;

the Yew is present in so many U.K. churchyards

- because it was traditionally a sacred tree
- because the branches made good bows and it was necessary to grow it somewhere free from grazing animals
- because early priests were teachers, had no schools, and its spreading branches provided suitable cover.
- because it was better for yew than me to be in the graveyard.

* * * * *

"Forest" in Norman times referred to "an open heath into which game may be driven from the woods around that the King and his Squires might have sport."

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SAFETY SUGGESTION OF THE MONTH

A "safety axe stone" (completely eliminating sliced fingers) can be made by glueing together two ordinary axe stones - rough side to smooth side - with Araldite Adhesive.

(Contributed by R. Zappara of the Mundaring Weir Safety Committee)

AERIAL SPRAYING OF JARRAH LEAF MINER IN W.A.

by G.W. VanDidden.

(1) Introduction:

Wallace (1966) showed that the jarrah leaf miner (Lepidoptera: Incurvariidae) could be controlled in individual trees by injecting a systemic insecticide, dimethoate, directly into the trunk of the tree. Whilst this method is simple, effective and relatively cheap where individual trees are concerned, it is clearly unsuitable for large areas of dense forest where labour costs would be prohibitive.

In an exploratory experiment Curry (1966 unpublished) found that dimethoate was also effective when applied as a spray to the foliage of the tree, although in this instance a large amount of water was used and the leaves were actually saturated.

In view of these results the jarrah leaf miner group (Forests Department, C.S.I.R.O. and Department of Agriculture) decided to experiment with aerial application which is particularly suited to large areas in which access is often difficult.

(2) Organisation:

Cost of insecticide, and application costs carried by the Forests Department.

Planning and maintenance of the experiment to be carried jointly by C.S.I.R.O., and the Department of Agriculture with assistance from the staff of the Forests Department.

(3) Plot Layout and Location:

Surveys in 1965 and 1966 had shown that heavy leaf miner damage occurred in an extensive area of jarrah forest east of Manjimup. The likelihood of this being repeated in 1967 was confirmed by the large numbers of adult moths observed in the area in April and a suitable site was selected. This was located some 28 miles east of Manjimup just south of the Mordalup Road, and south west of its junction with Roo Road.

Six plots, each approximately 16 acres in area, or 4 chains wide by 40 chains long, were marked out, running west from Roo Road. The plots were separated by buffer areas 8 chains wide, the three northerly plots being separated by buffer areas 8 chains wide, also the three northerly plots being separated from the three southerly plots by Cessna Road, which runs west from Roo Road.

The actual areas of the plots decreased slightly from north to south, due to the delineation of the western boundary road. Plot 1 was in fact 17.6 acres in area compared with 14.0 acres for Plot 6. Two control areas were selected; one $\frac{1}{4}$ mile to the east and the other $\frac{1}{4}$ miles to the west of the plots to be sprayed.

(4) Insecticide Treatments:

The insecticide selected - Diostop - is a 40% emulsifiable concentrate of dimethoate, containing 4 lb per gallon active ingredient.

The six treatments chosen gave a dosage range of from 4 to 128 oz a.i. per acre. The main object of this wide range was to ensure that at least some control was achieved regardless of cost. The highest dosage rate, consisting of undiluted concentrate, was clearly uneconomic.

(5) Application:

Spraying was carried out by Agriculture and General Aviation Pty. Ltd. of Jandakot on June the 9th, 1967, between 1300 and 1630 hours using a single engined high wing Cessna Monoplane.

The aircraft was fitted with two Britten-Norman Microair atomisers one under each wing delivering a droplet size of 100 to 120 microns.

Thirty six gallons of insecticide were carried per sortie and sprayed at a rate of 2 gallons per acre over a swathe width of one chain. The aircraft was flown from Mr. E. Muir's airstrip, situated 6 miles north west of the Plots.

The insecticide treatments were mixed and loaded at the airstrip under the supervision of a technician from C.S.I.R.O.

To ensure the dosages delivered per plot were accurate, each quantity of insecticide and water was carefully measured. After the flight the tank was completely drained and the remaining quantity measured. This would allow then for the accurate amount to be calculated for the rate of application to each plot. The mixture strength could not be increased, if any liquid remained in the delivery pipes, due to the commencement of spraying, with the lower dosages first and increasing the dosage for each plot.

Each plot was covered by four swathe widths, the aircraft being flown twice in each direction, east/west, west/east, at a minimum height above the tree tops.

The plot ends were marked by red hydrogen filled balloons, two feet in diameter, flown on 120 ft. strings , to above tree top level. One balloon was tethered one chain in from each of the four corners of the plot.

The balloons were filled from a hydrogen cylinder carried in the back of a vehicle, then tethered on approximately 6 ft. of string in a position ready for release to the full length of string of 120 feet when required.

Contact between east and west side personnel, controlling the marker balloons, was by means of two "Pony" transistor walkie-talkie sets over a range of half a mile through heavy wooded forest. The quality of sound reproduction is something which could be improved , voice distortion being very high; only 30 % of the messages could be clearly understood. Air to ground contact was maintained by a vehicle from A.G.A. fitted with the plane's V.H.F. Frequency. The messages were then passed on through the pony sets.

When the balloons were up and ready the okay was given for the plane to start. Due to the relative short distance of 6 miles from plots to the airstrip the plane could be heard taking off. A flare was fired to facilitate locating the starting point of each strip after the plane was airbourne and approximately 4 miles away.

As one plot was completed, the plane returned to the airstrip to refill with a stronger mixture of insecticide. The balloons of the completed plot were then pulled down, and the personnel shifted to the next plot to let up the balloons for the next spray trial.

The weather conditions during the spraying were: gusty winds from 7 to 12 m.p.h. at the start, then winds dropping to 1 -2 m.p.h. at the last 2 plots, which then were ideal conditions.

(6) Sampling:

No large scale sampling of the leaf miner populations has been attempted before. Therefore it was decided to take advantage of this experiment to gain experience in sampling techniques in the field and to provide data for statistical analysis of sample size etc.

Before treatment, an east/west base line was established down the centre of the long axis of each plot.

Ten trees were selected in each plot to the north and south of this line, but no further than about 15 yards from it. Each tree was marked with a plastic band and numbered. Using a short barrelled .410 shotgun with 10 shot cartridges, ten leaves were removed from a minimum of two random locations of the crown of each tree. On an average 2.5 shots were required to remove ten leaves.

These leaves were then placed in plastic bags and taken back to the C.S.I.R.O. laboratory where all leaf miner eggs and larvae were individually dissected out and the number alive and dead recorded.

Two control areas were established, one 'western control' ¼ mile west of the main plot area and one 'eastern control' ¼ mile east of the main plot area.

In each control area five trees were sampled.

(7) Results:

Treatment	Percentage dead larvae			Variation in % larvae mortality between trees at 5.7.67.
Dimethoate active Ingredient	Pre-treatment -		Post-treatment	
	6.6.67 -	20.6.67 -	5.7.67	
Control Nil	5.0 -	10.3 -	29.3	0 - 100
4 oz per ac.	2.3 -	26.1 -	43.7	10 - 58
5.6 oz per ac.	8.2 -	13.5 -	16.1	4 - 60
16.4 oz per ac.	7.5 -	11.0 -	25.3	15 - 67
30.8 oz per ac.	4.2 -	9.0 -	19.2	14 - 83
70.0 oz per ac.	6.5 -	15.6 -	33.6	8 - 72
155.4 oz per ac.	5.9 -	52.8 -	69.8	39 - 100

i) The highest dosage applied, 9.7 lb dimethoate active ingredient per acre, achieved about a 50% kill of larvae two weeks after spraying.

No additional mortality occurred between 2 and 4 weeks after spraying.

ii) The second highest dosage applied, 4.4 lb per acre, brought about some deaths but these would not amount to more than 10%.

iii) The relatively high mortality in the plot receiving the lowest dosage was almost certainly not due to any insecticide effect. In fact by chance in this plot, two "resistant" trees with many dead larvae occurred in the sampling. Individual larval mortality in these trees on July 5th was 58% and 49%. The overall mortality in the remaining 8 trees was only 29%, the same as the overall mortality in the trees in the control plots.

(8) Conclusion:

Aerial spraying with dimethoate can achieve mortality of leaf miner larvae and with higher rates of application, no doubt a near complete kill could be obtained. However, the cost of killing 50% of the larvae is already in the vicinity of $70 per acre and this would appear to be quite uneconomic on present evidence.